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Reply to Office Action of May 28, 2010

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1	 (Currently Amended) An article of manufacture, comprising:
2	a non-transitory program storage device having stored thereon program instructions
3	executable by a processing device to perform operations for estimating motion $\frac{\text{trials}}{\text{in video}}$ an
4	image sequences, the operations comprising:
5	providing data points representing information from [[an]]the image sequence; and
6	performing regression clustering using a K-Harmonic Means function to cluster the data
7	points and to provide motion information regarding the data points;
8	wherein the performing regression clustering includes:
9	selecting a number, K, of regression clusters for the data points from [[an]]the
10	image sequence;
11	initializing regression functions for each of the K clusters to estimate eenters of
12	motion paths in the image sequence for the data points;
13	calculating distances from each-values representing errors between the data point
14	to each points and corresponding ones of the K regression functions;
15	calculating a membership probability for each data point based on distances
16	between the K regression functions and each data pointthe values representing errors;
17	applying regression to recalculate the K regression functions based at least on the
18	membership probabilities;
19	determining whether changes in membership probabilities or changes in the K
20	regression functions satisfy a stopping criterion;
21	repeating calculating the distancesvalues representing errors, calculating the
22	membership probability, applying regression, and determining whether changes satisfy
23	the stopping criterion if the changes in membership probabilities or changes in the K
24	regression functions do not satisfy the stopping criterion; and

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25 using motion paths represented by the <u>recalculated K</u> regression functions if the

changes in membership probabilities or changes in the K regression functions satisfy the

27 stopping criterion.

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- 1 2. (Currently Amended) The program storage device-article of claim 1, wherein the
- 2 performing the regression clustering using the K-Harmonic Means function to cluster the data
- 3 points and to provide motion information regarding the data points further comprises providing
- 4 motion vectors for the data points,
- 1 3. (Currently Amended) The program storage device article of claim 1, wherein the
- 2 performing the regression clustering using the K-Harmonic Means function to cluster the data
- 3 points and to provide motion information regarding the data points further comprises providing
- 4 at least one motion path for the data points.
- 1 4. (Cancelled)
- 1 5. (Currently Amended) The program storage device article of claim 1, wherein the
- 2 initializing the regression functions for each of the K clusters further comprises randomly
- 3 initializing regression functions for each of the K clusters.
- 1 6. (Cancelled)
- (Currently Amended) The program storage device article of claim 1, wherein the program
- 2 instructions are executable to further calculate a weighting factor for each data point based on
- 3 distances the values representing errors between the K regression functions and each the data
- 4 pointpoints, wherein the weighting factor is chosen to allow the K regression functions to be
- 5 optimized with less sensitivity to initialization of the K regression functions.
- 1 8. (Currently Amended) The program storage device-article of claim 1 further comprising
- 2 extracting data according to a predetermined criteria to provide the data points.

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- 1 9. (Currently Amended) The program storage device article of claim 8, wherein the
- 2 extracting data according to the predetermined criteria comprises portioning data according to
- 3 color.
- 1 10. (Currently Amended) The program storage device article of claim 1, wherein the program
- 2 instructions further include instructions for performing the operations comprising preparing each
- 3 of the data points as x-y-coordinate data points.
- 1 11. (Currently Amended) The program storage device article of claim 1, wherein the program
- 2 instructions further include instructions for performing the operations comprising using the
- 3 recalculated K regression functions to render the image sequence with motion paths shown on a
- 4 display.
- 1 12. (Currently Amended) The program storage device article of claim 11, wherein the using
- 2 the recalculated K regression functions to render the image sequence further comprises
- 3 overlaying the recalculated K regression functions on the video-images of the image sequence to
- 4 show motion between the video images.

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1 (Currently Amended) A system for estimating motion trials in video image sequences, 2 comprising:

at least one processor;

an image sequence retrieval module for retrieving a current image and a first reference image and providing data points representing information from the current image and the first reference image; and

7 a motion estimator, coupled to the image sequence retrieval module, for performing 8 regression clustering using a K-Harmonic Means function to cluster the data points and to 9 provide motion information regarding the data points;

10 wherein the motion estimator performs-is configured to perform regression clustering by 11 selecting a number, K, of regression clusters for data points from an image sequence including 12 the current image and the first reference image, initializing initialize regression functions for 13 each of the K clusters to estimate eenters of motion for the data points, calculating distances 14 from each motion paths in the image sequence, calculate values representing errors between the 15 data point to each points and corresponding ones of the K regression functions, calculating 16 calculate a membership probability for each data point based on distances between the K regression functions and each data point, applying the values representing errors, apply 17 regression to recalculate the K regression functions based at least on the membership 18 19 probabilities, determining determine whether changes in membership probabilities or changes in 20 the K regression functions satisfy a stopping criterion, repeating repeat calculating the

distances values representing errors, calculating the membership probability, applying regression, 22 and determining whether changes satisfy the stopping criterion if the changes in membership

23 probabilities or changes in the K regression functions do not satisfy the stopping criterion, and

24 usinguse motion paths represented by the recalculated K regression functions if the changes in

membership probabilities or changes in the K regression functions satisfy the stopping criterion,

26 wherein the image sequence retrieval module and motion estimator are executable on the

27 at least one processor.

1 14. (Currently Amended) The system of claim 13, wherein the motion information regarding 2 the data points further-comprises motion vectors for the data points.

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- 1 15. (Currently Amended) The system of claim 13, wherein the motion information regarding
- 2 the data points further comprises at least one motion path for the data points.
- 1 16, (Cancelled)
- 1 17. (Previously Presented) The system of claim 13, wherein the motion estimator is to
- 2 randomly initialize regression functions for each of the K clusters.
- 1 18. (Cancelled)
- 1 19. (Currently Amended) The system of claim 13, wherein the motion estimator is to further
- 2 calculate a weighting factor for each data point based on distances between the values
- 3 representing errors between the K regression functions and each the data pointpoints, wherein the
- 4 weighting factor is chosen to allow the K regression functions to be optimized with less
- 5 sensitivity to initialization of the K regression functions.
- 1 20. (Previously Presented) The system of claim 13, wherein the motion estimator is to extract
- 2 data according to predetermined criteria.
- 1 21. (Previously Presented) The system of claim 20, wherein the motion estimator is to extract
- 2 data according to color.
- 1 22. (Previously Presented) The system of claim 13, wherein the image sequence retrieval
- 2 module is to prepare each of the data points as x-v-coordinate data points.
- 1 23. (Currently Amended) The system of claim 13, wherein the at least one processor is
- 2 configured to use further comprising a processor for using the recalculated K regression
- 3 functions to render the image sequence with motion paths shown on a display.

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- 1 24. (Currently Amended) The system of claim 23, wherein the at least one processor overlays
- $2 \hspace{0.5cm} \underline{\text{is configured to overlay}} \hspace{0.1cm} \text{the K regression functions on the } \underline{\text{video}} \hspace{0.1cm} \text{-images} \hspace{0.1cm} \underline{\text{of the image sequence}} \hspace{0.1cm} \text{to}$
- 3 show motion between the current image and the first reference image.

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1	25. (Currently Amended) A method for estimating motion trials-in video an image	
2	sequencessequence, the method comprising:	
3	providing data points representing information from [[an]]the image sequence; and	i
4	performing, by [[a]]at least one processor, regression clustering using a K-Harmor	iic
5	Means function to cluster the data points and to provide motion information regarding the	data
6	points,	
7	wherein the performing regression clustering comprises:	
8	selecting a number, K, of regression clusters for the data points from [[an]] <u>the</u>
9	image sequence;	
10	initializing regression functions for each of the K clusters to estimate ee	nters of
11	motion paths in the image sequencefor the data points;	
12	calculating distances from each values representing errors between the da	ta point
13	to each points and corresponding ones of the K regression functions;	
14	calculating a membership probability for each data point based on de	istances
15	between the K regression functions and each data pointthe values representing error	ors;
16	applying regression to recalculate the K regression functions based at leas	t on the
17	membership probabilities;	
18	determining whether changes in membership probabilities or changes in	the K
19	regression functions satisfy a stopping criterion;	
20	repeating calculating the distances values representing errors, calculat	ing the
21	membership probability, applying regression, and determining whether changes	satisfy
22	the stopping criterion if the changes in membership probabilities or changes in	the K
23	regression functions do not satisfy the stopping criterion; and	
24	using motion paths represented by the recalculated K regression function	s if the
25	changes in membership probabilities or changes in the K regression functions sat	isfy the

26.-29. (Cancelled)

stopping criterion.

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